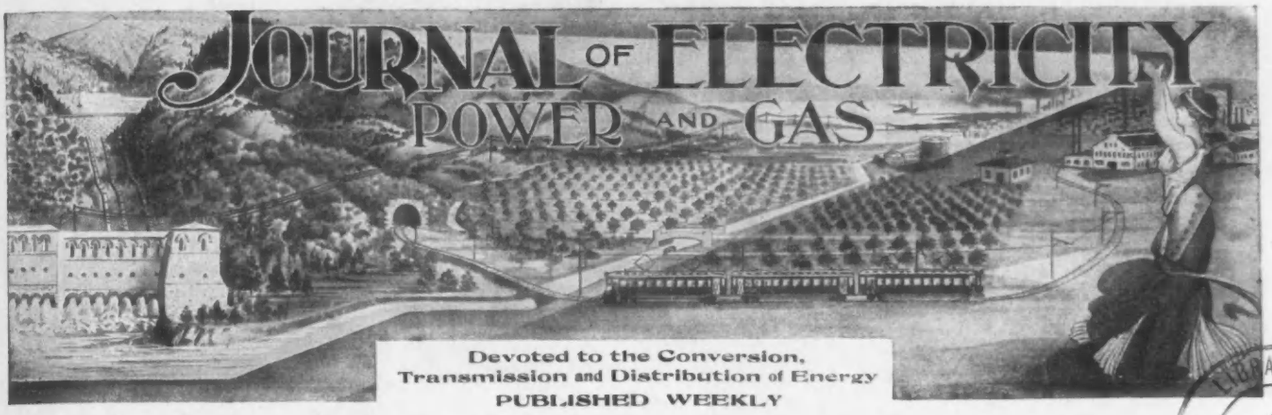


LIBRARY OF CONGRESS
APR 10 1908
PERIODICAL DIV.

BY THE TECHNICAL PUBLISHING COMPANY, 111 NEW MONTGOMERY STREET, SAN FRANCISCO CAL.
Entered as second-class matter May 7, 1906, at the Post Office at San Francisco Cal., under the Act of Congress March 3, 1879.

VOL. XX. No. 15 SAN FRANCISCO, CAL., April 11, 1908. Yearly subscription $2.50. Single copies 10 cents. Back numbers prior to current month 25 cents.

INSULATORS

The most perfect glass insulator made is the HEMINGRAY TEAT INSULATOR.

The Teats on the lower rim of the petticoat attract the water on the outer and inner surfaces of the insulator into drops. The water drops from these points on to the cross arm, thereby preventing the moisture from creeping to the pin.

A Complete Stock Carried

Electric Appliance Company
726-728-730 Mission Street
San Francisco

STANDARD UNDERGROUND CABLE CO.
MANUFACTURERS OF
BARE AND INSULATED WIRES AND CABLES
CHICAGO NEW YORK PITTSBURG BOSTON PHILADELPHIA ST. LOUIS ATLANTA SAN FRANCISCO
Pacific Coast Dept., A. B. Saurman Manager, Shreve Bldg., San Francisco, Cal.
SUB. OFFICE—LOS ANGELES, CAL.

OKONITE WIRE
The Standard for Rubber Insulation
Okonite Tape, Manson Tape
Candee Weather-proof Wire,
Candee (Patented) Potheads.
THE OKONITE COMPANY, 253 BROADWAY, N. Y.

INDIANA RUBBER AND INSULATED WIRE CO.
MANUFACTURERS OF
PARANITE AND PEERLESS RUBBER COVERED WIRES AND CABLES
Underground, Aerial, Submarine and Inside Use
TELEPHONE, TELEGRAPH, AND FIRE ALARM CABLES
All Wires are Tested at Factory JONESBORO, IND.
Electric Appliance Company
728 Mission St., San Francisco, Pacific Coast Agents

Specify
Brookfield
Glass Insulators
The Standard

VULCAN
Refrigerating and Ice Making Machinery
Manufactured by
VULCAN IRON WORKS
OFFICE: 702 ATLAS BLD'G. 604 MISSION STREET WORKS: FRANCISCO AND KEARNY STS.
San Francisco, California.

The National Conduit & Cable Co.
Manufacturers of
TROLLEY WIRE
BARE COPPER WIRE AND CABLES
WEATHER-PROOF WIRES AND CABLES
PAPER-INSULATED CABLES
FOR TELEPHONE, TELEGRAPH AND POWER
703 MONADNOCK BUILDING, SAN FRANCISCO, CAL.
C. H. PENNOYER, PACIFIC COAST MANAGER

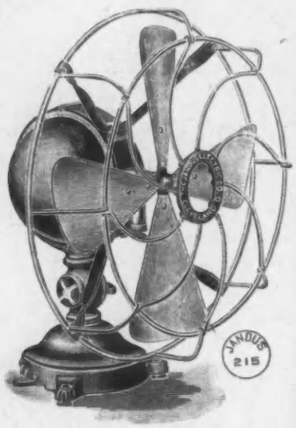
VAN EMON ELEVATOR CO.
MANUFACTURERS OF HIGH-GRADE ELEVATORS
R. J. DAVIS, President
B. C. VAN EMON, Vice-President and Manager
N. B. RATHBONE, Secretary and Treasurer
NOT IN THE ELEVATOR TRUST
DIRECTORS
LOUIS F. MONTEAGLE W. P. PLUMMER
GEO. M. PINCKARD R. S. HUNKINS
OFFICE AND CONSTRUCTION DEPARTMENT
TECHNICAL BLDG., 111 NEW MONTGOMERY ST., SAN FRANCISCO
FACTORY AND FOUNDRY
WEST BERKELEY, CAL (32,000 sq. ft.)

ORDER YOUR 1908

Fan Motors

NOW

The "Jandus - Swivel and Trunnion" Alternating Current Fan Motor can be used either as a bracket or desk fan. It is made in the Oscillating as well as regular style.



They have 2 speeds and are noiseless in operation.

Our Gyro Alternating Current Ceiling Fans give eutire satisfaction.

They operate at different speeds and will do the work of 2 ordinary paddle fans.

Send for our new 1908 Fan Motor Contract to-day.

Standard Electrical ... Works ...

123 New Montgomery St., San Francisco, Cal.

All Kinds of Lamps

California Incandescent Lamp Co.

Kearny 1077 117 New Montgomery St., San Francisco

"CENTURY"

Single Phase MOTORS

are the result of years of experience in the design and construction of this type of motor.

They are self starting under load, efficient, automatic in operation, and constructed for severe service.

Manufactured by

CENTURY ELECTRIC COMPANY

ST. LOUIS, MO.

Standard Electrical Works, Agents, San Francisco

SIMPLEX

RUBBER INSULATED

WIRES AND CABLES

Aerial Submarine
Flameproof
Lead Covered Steel Taped

PROMPT ATTENTION TO SPECIAL REQUIREMENTS

THE SIMPLEX ELECTRICAL Co

110 STATE STREET, BOSTON.

STANDARD ELECTRICAL WORKS

AGENTS

121 NEW MONTGOMERY ST. SAN FRANCISCO

THE

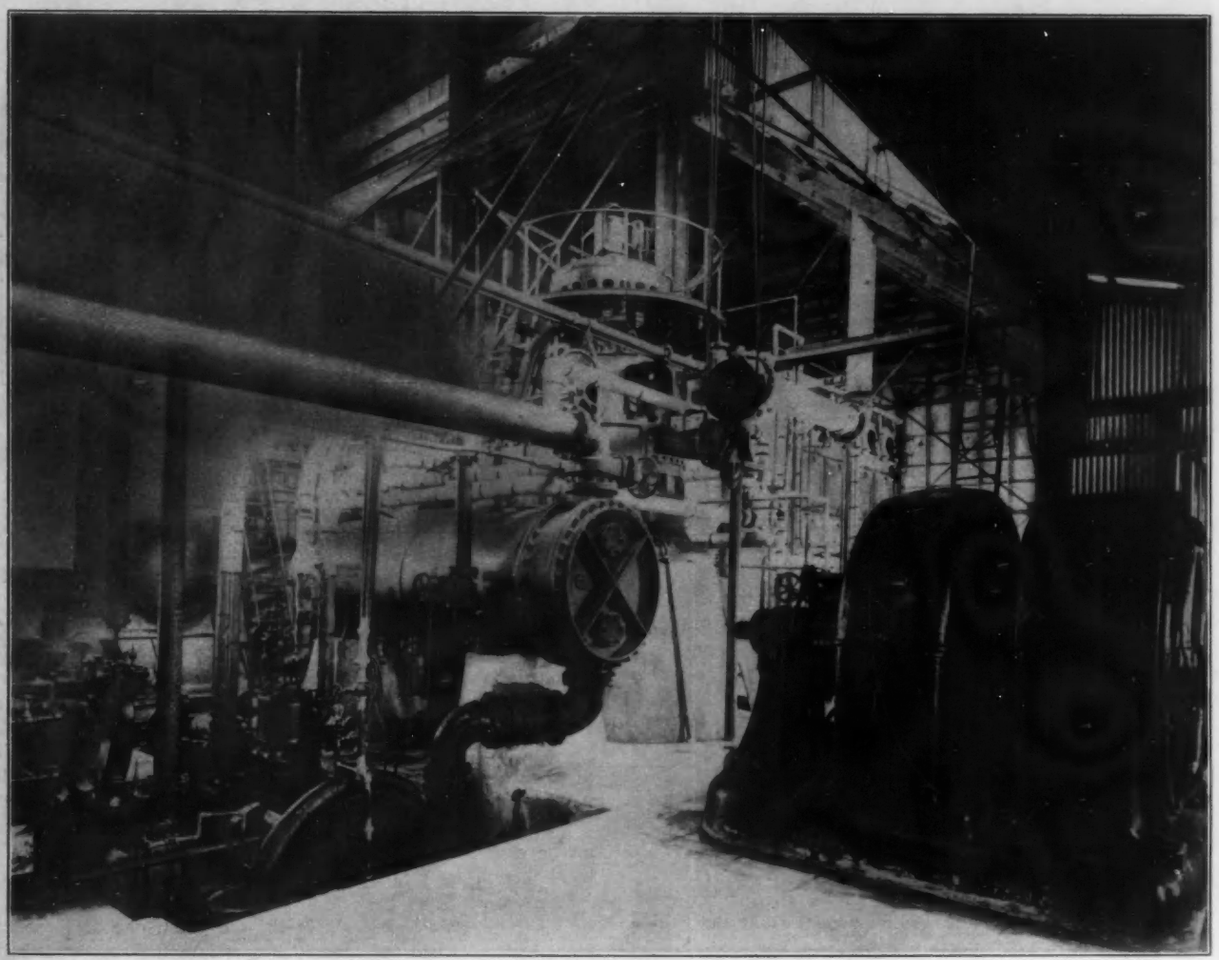
Journal of Electricity, Power and Gas

Devoted to the Conversion, Transmission and Distribution of Energy.

VOLUME XX. SAN FRANCISCO, CAL., APRIL 11, 1908 No. 15

MONTEREY NEW TURBINE-ELECTRIC PLANT.

There is nothing more indicative of the spirit of progress than the scrapping of old plants when new and better apparatus is available. This is exemplified in the new steam turbine installation at Monterey, Cal., which has replaced the steam-electric plant which was finished in January, 1903. This plant, which was fully described in the "Journal of Electricity, Power and Gas" of September, 1904, together with the plant at Salinas, Cal., was taken over in December, 1906, by new men, and operated as the "Monterey County Gas and Electric Company," which, in itself, is the result of the consolidation of the Monterey Gas and Electric Company which was incorporated April, 1902, and the Salinas Water, Light and Power Company, which was formed in 1901. The condition of the plants taken over by the new company was found to be bad both at Monterey and Salinas, as regards quantity and quality of service, demanding immediate attention to produce order out of chaos. Monterey was taken in hand first.

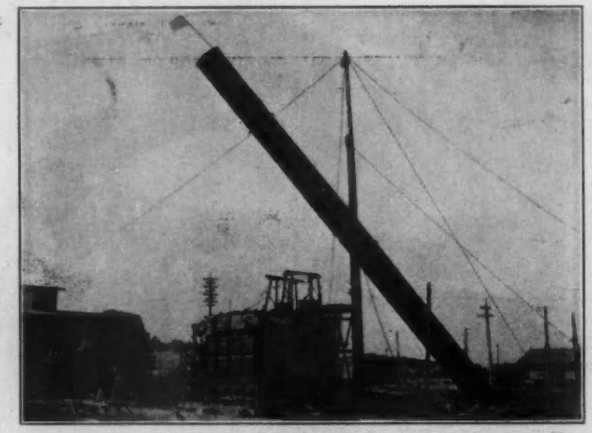


STEAM TURBINE, GENERATOR AND MOTOR GENERATOR SET.

In the old plant three 150-horsepower return tubular boilers were supposed to furnish steam for three Corliss engines aggregating 500 horsepower. Belt-driven from these were three National Electric alternators, furnishing two-phase current at 60 cycles and 2300 volts, having a total capacity of 550 kilowatts. In addition there was a 160-kilowatt motor-generator set and an auxiliary unit of 100 kilowatts driven by a 100-horsepower Corliss engine. At the time the plant was taken over, it was inadequate to meet the demands of the lighting and railway systems supplied and was causing great dissatisfaction and complaint among consumers. The voltage was low at peak and minor accidents often compelled a shut-down of one or more feeders. General Manager W. H. P. Hill at once called the attention of the directors to these conditions, and they determined to install a new generator station of sufficient size, not only for immediate needs, but also for possible growth, together with a reserve capacity to guard against ordinary shut-downs.

As a result of this decision there has just been installed one of the most modern electric power plants in the West. It consists essentially of two 500-kilowatt Curtis turbines, each driving a General Electric 2300-volt, three-phase alternator. The plant is run condensing, salt water being pumped from Monterey Bay.

The boilers and all auxiliary apparatus were supplied by Chas. C. Moore & Company, engineers, of San Francisco, the General Electric Company furnishing and installing the turbine, generators, railway motor-generator set and switchboard. This apparatus is all housed in a corrugated iron building with steel roof trusses and supporting beams, the foundations being of concrete, as shown in the accompanying picture. The handling of the apparatus is facilitated by a 10-ten, hand-power crane, giving access to all parts of the generator room. As the plant consists of two similar units, the description of one will suffice for both.



RAISING STACK, SHOWING BOILERS AND CONCRETE FOUNDATIONS.

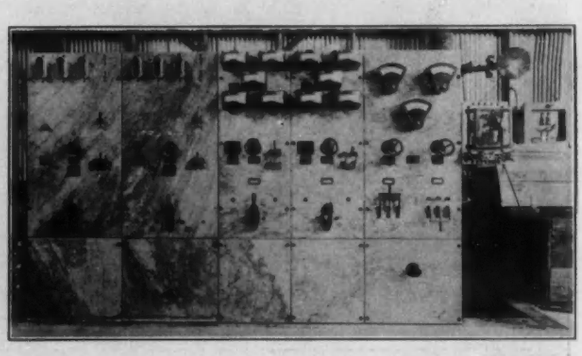
The Curtis, as is well known, is a vertical impulse turbine, the machines in question having two stages and utilizing the steam from the boiler pressure of 150 pounds down to a vacuum of about 28 inches. This vacuum is produced by Wheeler pumps 6x14x10. One of the most important features in the equipment is the step-bearing, by means of which the weight of the turbine and generator is supported on a thin film of oil supplied at 230 pounds pressure by Worthington pumps. So slight is the friction that the mass continues to revolve for an hour and forty minutes after the steam has been shut off, and the vibration is so little that a dollar can be balanced on the machine while it is running at 1800 revolutions per minute. The oil from the step-bearing is continuously circulated, being run through a Turner filter to cleanse it. The oil for the guide vanes and for the hydraulicly operated valves is delivered through a baffler from the same pump that furnishes oil for the step-bearing.

The exhaust steam is condensed in a Wheeler condenser of 2350 square feet, salt water being pumped from the bay by means of an 8-inch centrifugal pump, direct driven by a 6x6 Wheeler engine. The pumping system is an adaptation of the previously existing plant, and it was found that air in the pipe lines interfered with the continuous supply of water. To avoid this a 9x10 Westinghouse air pump, locomotive type, was connected with centrifugal pump and the high point in the line so as to remove the air, after which all worked satisfactorily. From the condenser the hot water is pumped to a Cochrane feed-water heater by a 6x10x10 Wheeler direct-acting pump, the feed to this hot well pump being automatic. Thence the water is pumped to the boiler by Snow steam pumps. The water is bought from the Pacific Improvement Company and forms the only weak link in the chain of an otherwise highly efficient system, its cost being high and its supply not wholly reliable.

Steam is supplied by two Babcock and Wilcox boilers which contain two drums and in which are 120 4-inch tubes, 10 high, 12 wide, and 18 feet long. The drums are 36 inches in diameter, three-eighths of an inch thick, and 20 feet 4 inches long. These are made of open hearth steel and rated at 160 pounds pressure and 250 horsepower. Arrangements will be made for additional boiler equipment as the capacity of the plant demands, and so fast is the current consumption increasing that this necessity has already been felt. The boilers are oil burning, the oil being furnished by two Snow pumps, each 4½x2¾x4.

The generator is a General Electric 500-kilowatt, three-phase, 2300-volt, 4-pole alternator, revolving at 1800 revolutions per minute. The fields are excited by an 80-ampere, 125-volt, type M. D., General Electric dynamo, direct connected to a General Electric Marine engine with 6½x5-inch cylinder, running at 450 revolutions per minute.

All this is controlled by a 7-panel switchboard, two railway panels not being shown in the accompanying picture. The first two panels shown are outgoing railway feeders, each being equipped with fuse blocks and switches. The third and fourth are generator panels, one for either machine. They are each



SWITCHBOARD.

equipped with three Thomson ammeters, one for each phase, and one Thomson ammeter showing the current going to the armature of the generator, one Thomson voltmeter, one 100-ampere, 250-volt, General Electric field switch, and one 500-kilowatt, 2300-volt, 125-ampere rheostat. The fifth is the exciter panel and is equipped with two Thomson astatic ammeters, one for each exciter, one voltmeter and one rheostat, the exciters being capable of being switched to either machine. The lower rheostat controls the Terrill regulator which is shown to the right of the last panel and ensures accurate voltage control for the system.

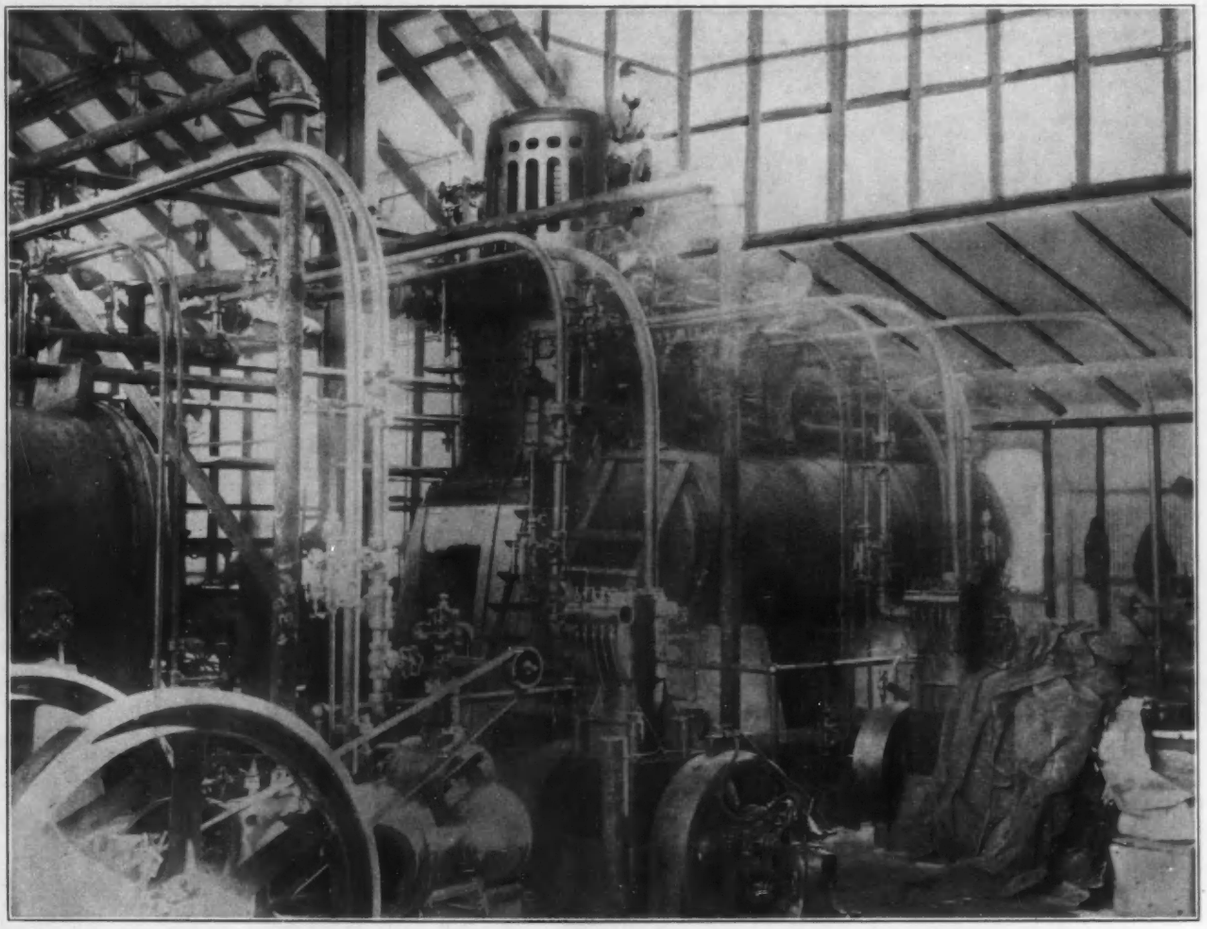
The newly installed railway motor generator set consists of a three-phase General Electric induction motor, 60 cycles, 2300 volts, 110 amperes, and a type M. P. C. direct-current dynamo furnishing 300 kilowatts at 500 volts. The old two-phase motor generator set will be used as a reserve, being supplied with current by means of two phase-reducer type H transformers.

Owing to a break-down in the old plant, one of these turbines had to be started several days before the time stated, but it ran continuously for fifty-four days without a shut-down, and that because of defective packing on a steam valve. Since then the run has been exceedingly satisfactory.

Street Railway.

As has already been indicated, this company not only supplies current for lighting, but also operates the street railway service between Monterey, Del Monte, Pacific Grove and environs, a total of 5.6 miles of main line. It was formerly subject to many breakdowns and delays and had a somewhat irregular schedule. Under the new management these have been largely eliminated and improvements are now in contemplation which include the complete rebuilding of the trolley feeder and a broadening of the track gauge. The press of

traffic and the demands upon the management's time due to the installation of the new power station, has deferred much of this improvement. Additional cars have already been put on, making twenty minutes headway on the main line. The time of operating has been increased to 19 hours from 17½. There are ten cars in all, two having been rebuilt in the company's own shops. These include two 34-foot combination 8-wheelers, which are equipped with two 35-horsepower Westinghouse motors and General Electric K. 10 control; one 34-foot closed car with similar equipment; two 34-foot open cars with two Walker 25-horsepower motors and General Electric K. control; two 28-foot combination cars with the same equipment, and two 20-foot 4-wheel dinkies. The machine shop has sufficient capacity to handle all the heavy part of the cars and power plant and has consequently considerably reduced the maintenance cost. This equipment includes a Barnes No. 5 26-inch drill press, McCabe 22-foot bed, 50-foot swing, lathe, and 150-ton hydraulic wheel press.



INTERIOR OF POWER PLANT.

Gas Plant.

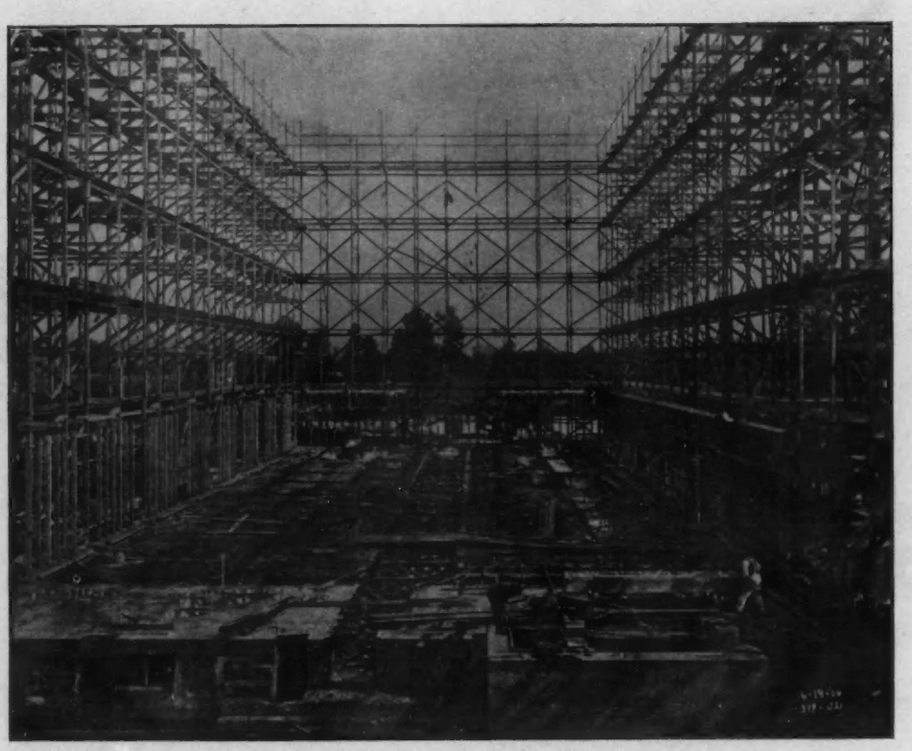
The company also supplies gas to Monterey and suburbs, using the Lowe process. This plant was installed in the early part of 1903. The generator, superheater, washer, scrubber and scrubber condenser being contained in separate shelves, in accordance with the practice at that time. Details of this plant were given in the "Journal of Electricity, Power and Gas" in September, 1904. Since then the pipe line has been completed from Coalinga and the oil is now piped directly to the plant. The mains were originally laid without a definite system and many gas complaints were traceable to deficient distribution rather than insufficient generator capacity. For several months a systematic examination and to some extent a rebuilding of branch mains was carried out, but the consequent increase of business occurring simultaneously with efforts to improve the old service brought the company face to face with the necessity of installing additional gas-generating plant within the coming year. Other troubles have been met and overcome, such as compressor breakdowns, failure of the motive power, etc., but these are ordinary incidents in the operation of small gas plants. During the past year the amount of gas manufactured has averaged one and one-half million cubic feet per month, but this will probably be doubled within the next eighteen months. Some tentative plans have been made regarding a new high-pressure system in connection with a new gas plant, the present pressure being three pounds. When this material is added, it will be fully described in an early issue of the "Journal."

Thus concludes another chapter in the development of the power and light supply of Monterey County. Great credit is due to Mr. W. H. P. Hill, general manager, and Mr. F. J. Sutherland, general superintendent, for the energetic manner in which they have accomplished this work of operation and simultaneous rebuilding in the face of contending odds. The officers and directors of the Monterey County Gas and Electric County are Mr. H. Hazleton, President; Mr. J. M. Gardiner, Vice-President; Mr. H. R. Hudson, Treasurer; Mr. Burke Corbett, Secretary, and Mr. C. K. MacIntosh. To Mr. Sutherland and his assistants as well as the General Electric Company and Chas. C. Moore & Co. of San Francisco we are indebted for the information in this article, and to Mr. Chas. Libhart for the photographs illustrating it.

REINFORCED CONCRETE POWER STATION.*

In the wide range of construction where reinforced concrete is displacing other materials, no field is more promising than that of power stations and other structures which house heavy machinery. In general, such structures require to be of permanent character, free from vibration and fireproof. No other material can compete with reinforced concrete where permanency and freedom from vibration are requisite.

Structures formed with members whose stiffness and rigidity depend on joints and connections being made up with a number of individual parts cannot compete in cost with those constructed with a material which can be moulded in place and become a monolith.



INTERIOR VIEW OF STAGING. FOUNDATIONS ARE COMPLETE, AND SIDES AND BOTTOM OF TRENCH IN CENTER OF BOILER ROOM HAVE BEEN CONCRETED. FORMS FOR THE OUTSIDE WALLS OF BOILER-ROOM UP TO THE BOILER-ROOM FLOOR LEVEL ARE IN PROGRESS.

Notwithstanding all that may be said for or against any material being fireproof, the most important feature of any fireproof structure, no matter what its material, is that when subjected to high temperature and suddenly cooled, its elements will not be injured nor its structural strength affected beyond repair at reasonable cost. Any structure formed with members which are solid and monolithic and non-inflammable will compare favorably with any other structure built up with a number of individual parts more or less rigidly fastened together.

The Georgetown Power Station, owned by the Seattle Electric Company, a corporation managed by Stone & Webster, of Boston, furnishes power for the electric and cable railways and the electric lighting business of Seattle, Washington. The structure is a unit which it is intended to duplicate from time to time as necessity demands.

The engine room is 64x79 feet, with a height over all of 80 feet. A 300-kilowatt Turbo-generator, with other accessories, is installed in this space. There is also space for another Turbo-generator of 500-kilowatt capacity to be installed in the future. The large generators occupy the center of 44 feet of the south side of the room, the balance of the space being taken up by accessories, locker rooms, offices, and switchboard. The switchboard, locker rooms, and offices are arranged in gallery floors on the north side of the engine room.

The area of the south side of the engine room, 44x78 feet, is covered by an electric crane of 50 tons capacity, the height in the clear being 54 feet. All equipment within the area covered by this crane is handled and set in position. Future renewals and repairs of equipment will also be handled and set in the same way. The 16x56-foot area in the north side of the engine room, directly beneath the switchboard gallery, in which are located two 500-kilowatt motor generators, a 75-kilowatt exciter, two 100-kilowatt and two 500-kilowatt transformers, is covered by a traveling crane of 10 tons capacity.

The boiler room adjoining the engine room is 154x77 feet, with an extreme height of 68 feet. This space is divided into three bays, the batteries of boilers being one each side of center of the building.

Unlike the engine room, which is a clear story from ground floor to roof, the boiler-room floor is 12 feet 6 inches above the grade level, and space for seven 100-horsepower units is provided, three batteries on the west and four on the east side of the building, only the three batteries on the west side being set at the present time. A 3,000-horsepower heater and two 14x9½x12-foot feed pumps are located in the north end of the boiler room. Directly above this, in the center, 20 feet above the boiler-room floor, is located a water tank of 20,000 gallons capacity. In the southwest corner of the boiler room the smoke stack is located. This stack is 49 feet high, supported on the roof of the building, being connected with a breeching at the back ends of the boilers. The breeching and stack at their intersection are equipped with a 7x16-foot diameter blower belted to an electric motor for mechanical draft.

*Reprinted by courtesy of California Journal of Technology.

A covered pipe trench 9 feet wide and 8 feet deep runs the entire length in center of boiler room, in which the intake pipes conduct the water from the Duwamish River to the condensers on the south side of the engine room. At right angles to this pipe trench, in the north end of the boiler room, is a tunnel which discharges the water back again to the river. The length of this tunnel is about 300 feet, the sectional area being of sufficient capacity for the total contemplated number of units when completed.

The structure was originally designed with a structural steel frame and brick curtain walls. At the time proposals for its erection were received, it was found that deliveries for structural steel could not be guaranteed in less than five months from signing of contract. Principally for this reason it was decided to change the construction to reinforced concrete; but in addition to slow delivery for structural steel, a scarcity of skilled mechanics and the high price of such labor was a further incentive to making the change.

The ground on which the structure is built is sand. There are 1712 piles in the foundations, average length 25 feet. While the sand was compact enough to support the necessary loads, it was not considered wise to assume that the areas between the river bank and the structure might never be disturbed by the flow of the river.

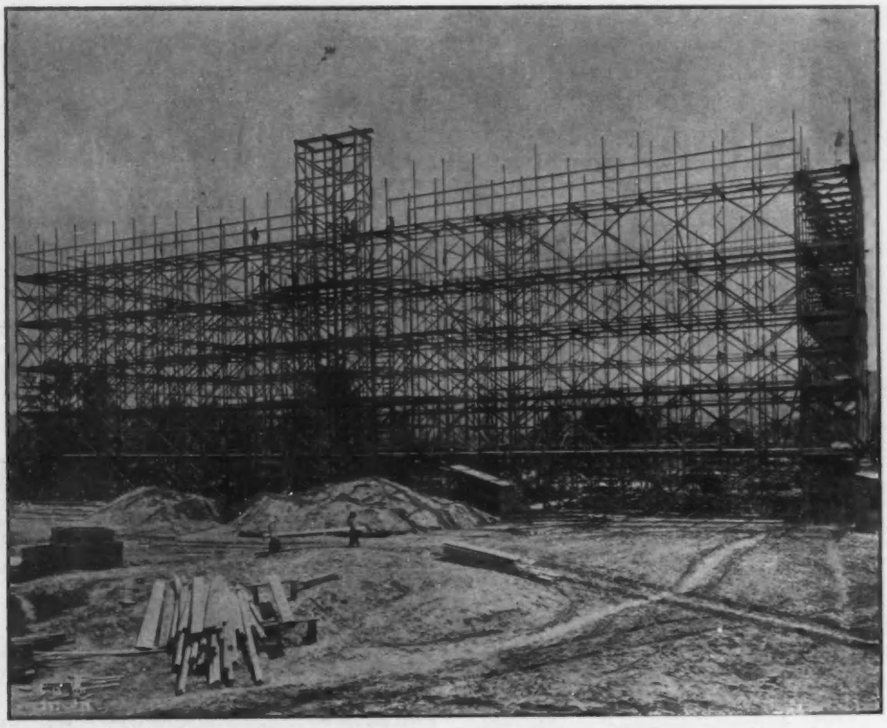
Like most of the work undertaken by Frank B. Gilbreth, speed was of utmost importance, and it was desirable to begin driving piles directly after the contract was signed. On account of this, approximate calculations of the loads were made before designs for the reinforced concrete construction were gotten out.

While in the construction of a building, work must begin at the foundations, just the reverse of this is done in the design, since working drawings for the foundations cannot be gotten under way until the entire design for the structure is complete.

Some time before pile driving was finished, working drawings for the foundations were completed and sent to the work, and this kept a large force of men at work on the structure while working drawings for the super-structure were in progress.

Due to the high price of broken stone, washed gravel was used for the aggregate, with the exception of some portions of the foundation and the wide-span girders in the engine-room roof. An imported Portland cement was used, the proportions generally being 1:2:4, except the wide-span girders, which were 1:2½:3.

With the exception of some corrugated bars, which were purchased from stock near the work, all the reinforcement consisted of round rods. Practically the entire amount was cut to schedule and shipped from Pittsburg direct to the work.



SHOWING STAGING WHICH WAS ERECTED IN ADVANCE OF THE STRUCTURE, WHILE WORKING DRAWINGS WERE BEING PREPARED AND MATERIALS WERE ON THE WAY TO THE SITE. HOISTING TOWERS ON EACH SIDE OF THE BUILDING ARE SHOWN. THESE HOISTS WERE USED FOR FORMS, REINFORCEMENTS AND CONCRETE.

To insure delivery within the time promised, a man familiar with long-distance freight shipments was sent to the mills, who, after personally seeing the material loaded on cars, remained with them until they reached their last transfer point. In this way the movement of cars all along the route was known, and possible delays, due to accidents and cars being temporarily side-tracked, were avoided.

Due to the absence of intermediate floors in the structure, it was found advisable to erect a staging entirely around it, the full heighth of, but just clear of the outside walls. From this staging, all forms for walls were built and the concreting done, runways within the staging connecting with the hoists at levels about every 12 inches in height being provided. This staging remained in position until after the walls had all forms removed and cleaned down. The erection of this staging progressed while the working drawings were being gotten out and while shipments of the steel reinforcement were on the way from Pittsburg.

Points of interest in the design to which special attention might be called are in connection with the 64-inch span girders supporting the engine-room roof. On account of their position in the structure in connection with the monitor which they support, only a rectangular section could be considered. So far as the writer is aware, these girders are the longest

span of any ever constructed whose section, at the point where maximum bending moment occurs, is rectangular. The assumed live load was taken at 30 pounds per square foot. The reinforcement consisted of 12—1¼-inch round rods, 8 in the bottom and 4 at the top, the bottom rods being bent up at the ends. The ends of these rods were threaded and rigidly secured to anchor plates by lock-nuts. In addition to separators formed with 1¼x1x3/16-inch angles and ¼x2-inch bars, which held the rods in position, vertical stirrups formed with ⅝-inch round rods were used.

The structural-steel design for this roof contemplaed a Warren girder built up with angles and plates. This truss was designed to support I-beam purlins, and a reinforced concrete slab spanning these purlins was intended.

In comparison with the reinforced concrete girders as built, it is interesting to know that, if the same live load is assumed and the depth for the Warren girder is the same depth as the concrete girder, the sectional area of metal (upper chord plus lower chord, including diagonal and vertical members) in the Warren girders per foot of span is practically the same as the sectional area of reinforcement (upper plus lower, plus the stirrups) of the concrete girder.

On the face of it, this statement at first glance would appear contradictory, but consideration of the fact that the upper member of the steel truss necessarily has to be of greater sectional area than the low member, due to its unsupported ½ length being in compression, while the larger portion of the reinforcement in the concrete girder is in the bottom, accounts for this seemingly contradictory statement. While the pound price for the round rod reinforcement would be but 65 per cent of the pound price of the structural steel, and this difference would be enough to pay for the concrete of the girder, the cost of the forms, amounting in this case to about 15 per cent additional, would be the amount the cost of the concrete girder would exceed the Warren girder.

Due to the dead weight of concrete and the limiting stresses to which this material may be subjected, any construction which contemplates wide spans for beams and girders is necessarily at a disadvantage when cost is compared with steel girders, unless such girders are protected in some way to compare favorably with reinforced concrete from a fire-proofing standpoint. In the present instance, the additional 15 per cent which the concrete girders exceeded the cost of the steel trusses would not pay for a satisfactory fireproof protection to the steel, so that in addition to the matter of delivery of structural steel and the advantage of having a homogeneous structure as against one constructed with several kinds of materials, when the two constructions are compared from a fire-proofing and a cost standpoint, the decision is in favor of reinforced concrete.

Concerning wide spans in reinforced concrete beams and girders, their design and construction are matters requiring much experience and good judgment. Investigation of existing wide-span structures as to cost and their success in meeting requirements of rational and safe engineering, will force the truth of this statement on anyone competent to give the subject consideration.

When, as in the present instance, only a rectangular section can be considered, enough reinforcement is used (in a section of a size which, on account of the dead weight of the material, will not be prohibitive) to insure the extreme fibre stress in concrete not exceeding 500 pounds per square inch, the stress in steel is reduced to a value much below 10,000 pounds per square inch, this from a cost standpoint alone will eliminate reinforced concrete from comparison with other materials it seeks to displace.

Even the matter of cost removed from the problem, when a permissible section, due to the excessive amount of steel, has a compressive area much greater than half the section, resulting in low values for steel in tension, and extreme fibre stress of concrete not exceeding 500 pounds per square inch in compression, the proposition becomes steel protected by concrete rather than concrete reinforced by steel. Enough experiments with sections having such large percentages of reinforcement have not been made to warrant our making the usual assumptions regarding beam action, which is permissible when a smaller percentage of reinforcement is used.

On account of these conditions it becomes necessary to consider greater extreme fibre stresses for compression in concrete. Enough reliable experiments have been made to show that concrete can be so proportioned and manipulated to realize an ultimate compressive strength of 2500 pounds per square inch at the age of 30 days, and about 4000 pounds per square inch at the age of 90 days.

While a permissible extreme fibre stress of 1000 pounds per square inch under these conditions would only give a factor of safety of 2.5 at the age of 30 days, it would seem reasonable to permit values approaching that amount when the design and construction are under the supervision of those who make a specialty of that class of work.

While the usual assumptions in regard to flexure and with the ratio of the moduli of elasticity of steel to concrete Es/Ec—15, the resulting stresses for these girders are 900 pounds per square inch extreme fibre-stress compression for concrete and 16,000 pounds per square inch tension for steel.

The maximum bond stress for reinforcement is 80 pounds per square inch, and the maximum sheer for concrete, 95 pounds per square inch, the value of vertical and diagonal sheer members being neglected.

The balance of the structure presents nothing unusual in design, except that all girders, beams and slabs have some reinforcement in their compression parts. The condition of continuity and monolithic action of reinforced concrete has been accepted, and assumptions which are considered rational have been made for all calculations, and reverse stresses due to possible unequal loading or negative moments are taken care of by reinforcement to meet these requirements. Where slabs are reinforced in both directions, the spacing is made to vary as closely as possible with the bending moment.

With the exception of the wide-span girders of engine-room roof, extreme fibre stress for concrete in compression is limited to 550 pounds per square inch, and steel in tension 15,000 pounds per square inch; bond stress in reinforcement not exceeding 75 pounds, and sheer in concrete 60 pounds per square inch.

Any reinforcement over 1 inch in diameter has positive end anchorage with plate washers rigidly secured with lock-nuts, and rods less than 1-inch diameter, except where entering outside walls and columns, are bent at right angles 3 inches from the ends.

Unit stresses in comparison for columns, due to direct and eccentric loading, are quite low, the maximum not exceeding 600 pounds and the minimum being as low as 190 pounds per square inch. Practical consideration in regard to these sections rather than limiting unit values for concrete in compression, determined their size.

In addition to stresses caused by static and moving loads, stresses as the result of vibrations due to possible seismic disturbances were constantly kept in mind, and all joints and connections were designed to meet these requirements.

Approved Electrical Devices

This department from time to time will contain an illustrated description of all fittings approved by the Underwriters' National Electric Association.

ASBESTOS.

"Ebony or Impregnated Asbestos Wood." This material possesses all the qualities of "Plain and Oak Asbestos Wood," but is better in non-absorption and dielectric properties. Approved for limited use, with suggestions for more extensive application, March 19, 1908. Manufactured by

Asbestos Wood Company, Nashua, N. Y.

GROUND CLAMPS.

"Bulldog" clamp for rigid conduit. A ½-inch copper strap with clamping screw forming lug for soldered connection to ground wire. Approved March 16, 1908. Manufactured by

Fairmount Electric Mfg. Co., 2322 Market Street, Philadelphia, Pa.

RECEPTACLES, WEATHERPROOF.

Cat. No. 9408, 3 A, 250 V. Approved February 27, 1908. Manufactured by

H. T. Paiste Co., 32d. and Arch Streets, Philadelphia, Pa.

RHEOSTATS.

C. H. Motor Speed Regulators, Bulletins 40, 41, 42, 43, 44, 44½, and 45. Approved March 17, 1908. Manufactured by

Cutler-Hammer Mfg. Co., Twelfth St. and St. Paul Ave., Milwaukee, Wis.

SOCKETS, STANDARD.

Bryant Brass Shell, Key and Keyless Fixture Sockets, "Security Snap," "New Wrinkle." Also above types with shade holders attached. Approved March 17, 1908. Manufactured by

Bryant Electric Co., Bridgeport, Conn.

SOCKETS, WEATHERPROOF.

"Paiste" Weatherproof Sockets, 3 A, 250 V, pendant style, porcelain shell, Cat. Nos. 9,366, 38,687, and 22,754; composition shell, 60,666. Bracket style, porcelain shell, Cat. Nos. 9,448, 9,496, 45,491, 45,492, 22,755, and 22,756. Approved March 17, 1908. Manufactured by

H. T. Paiste, Thirty-second and Arch Sts., Philadelphia, Pa.

SWITCH BOXES.

Ostrander Switch Boxes for flexible tubing, armored cable, flexible and rigid conduits. Approved March 16, 1908. Manufactured by

W. R. Ostrander Co., 22 Dey St., New York, N. Y.

"Renim" cast-iron boxes. Types A, B, B and E. Cat. Nos. 11 to 15 inclusive, 22 to 26 inclusive, 31, 41 to 46 inclusive, and 51, for knob and tube work. No. 61 for conduit work. Approved March 16, 1908. Manufactured by

Renim Specialty Co., Boston, Mass.

ATTACHMENT PLUG, FUSELESS.

"Benjamin," 3 A, 250 V. Cat. No. 903, with rotating screw shell and outlet bushing or cap holding cord without use of knot. Approved March 2, 1908. Manufactured by

Benjamin Electric Mfg. Co., 42 W. Jackson Blvd., Chicago, Illinois.

FIXTURES.

"Faries," portable types, equipped with approved reinforced portable cord and separable cap attachment plugs, Cat. Nos. 14, 23, 30, 63, 152, 153, 827, 1012, 1052 and 1842. Approved Mar. 10, 1908. Mfd. by

Faries Manufacturing Co., Decatur, Ill.

Post-Glover Electric and Combination Fixtures. Approved Feb. 26, 1908. Mfd. by

The Post-Glover Electric Co., 314 W. Fourth St., Cincinnati, Ohio.

LAMP GUARDS.

"New Keystone Guard," for portable lamps. A porcelain receptacle mounted in substantial wood handle with heavy cast collar and wire guards. For 16 and 32 C. P. lamps. Approved Mar. 10, 1908. Mfd. by

Electric Service Supplies Co., Keokuk, Iowa.

RECEPTACLES, STANDARD.

Porcelain shell, keyless. 3 A, 250 V. Cleat Type, Cat. Nos. 28794, 28795 and 11221. Concealed, Nos. 50744 and 50717. Conduit Box, Nos. 9397, 40537 and 49354. Sign Receptacles, No. 46627. Wall Sockets, brass shell, key, 50 C. P., keyless, 3 A, 250 V. Concealed base, Nos. 9184, 27742, 29404, 9185, 27743 and 29415. Angle base, Nos. 50753, 28721, 29406, 50755, 28722 and 29407. Approved Mar. 10, 1908. Mfd. by

General Electric Co., Schenectady, N. Y.

RECEPTACLES, WEATHERPROOF.

Combined cleat and receptacle, weatherproof type. Approved Mar. 10, 1908. Mfd. by

Electrical Products Co., Morristown, N. J.

ROSETTES, FUSELESS.

Fielding Rosettes. 3 A, 250 V. Cleat, concealed and moulding types. Cat. Nos. 433 to 438 inclusive, 441 and 480. Approved Feb. 27, 1908. Mfd. by

H. T. Paiste Company, 32nd and Arch Sts., Philadelphia, Pa.

SOCKETS, STANDARD.

Brass shell, key and keyless. Cat. Nos. 9386, 9392, 50760, 50768, 19386, 19392, 49386, 49392, 99386, 99392, 43389, 43390; and "Security Snap," Cat. Nos. 44147-44152 and 44814. 44815. Also above types with shade holders attached. Approved Feb. 27, 1908. Mfd. by

H. T. Paiste Company, 32nd and Arch Sts., Philadelphia, Pa.

SWITCHES, KNIFE.

Cornell Switches. 0-100 A, 250 and 600 V. Front or back connected, with or without extension for N. E. Code cartridge enclosed fuses, two and three pole. Approved Mar. 10, 1908. Mfd. by

Electric Fittings Co., Trumansburg, N. Y.

Paiste Porcelain Base Baby Knife Switches. 15 and 25 A, 125 and 250 V. Cat. Nos. 501 to 510 inclusive, and 513 to 522 inclusive. Approved Mar. 10, 1908. Mfd. by

H. T. Paiste Company, 32nd and Arch Sts., Philadelphia, Pa.

ATTACHMENT PLUG, FUSELESS.

Perkins Separable Cap, Edison Shell Attachment Plug, 3 A, 250 V. Cat. Nos. 3,284 and 3,530. Approved March 20, 1908. Manufactured by the

Perkins Electric Switch Mfg. Co., Bridgeport, Conn.

CABINETS.

Cuthbert panelboard cabinets, lined steel cabinets, and Types A and AA switch boxes and special theater cabinets; wooden cabinets with steel or slate linings; wooden cabinets with asbestos lining for use, except with metal conduit or armored cable. With steel or wooden fronts, with or without glass panels in doors. Approved March 20, 1908. Manufactured by

Cuthbert Electrical Manufacturing Co., 105-109 S. Clinton St., Chicago, Ill.

Steel panelboard cabinets, with or without steel gutters, with or without back wiring compartment. Metal doors, with or without glass panels. Also pressed-steel boxes for service entrance switches. Approved March 20, 1908. Manufactured by

Electric Mfg. Co., 926-940 La Fayette St., New Orleans, La.

THE JOURNAL OF ELECTRICITY POWER AND GAS

Published Weekly by

THE TECHNICAL PUBLISHING COMPANY

111 New Montgomery St., San Francisco, California

E. B. STRONG, President and Gen'l Manager

A. H. HALLORAN, Secy. and Managing Editor

Directors:

R. J. DAVIS
A. M. HUNT
E. M. SCRIBNER
C. L. CORY
E. B. STRONG

Yearly subscription, $2.50. Single copies, 10 cts. Back numbers prior to the current month, 25 cts. Canadian subscription $3.50. Foreign subscription, $4.00.

Subscriptions cannot be begun with back numbers.
Manuscripts submitted must be accompanied by postage to insure return.

Address all communications and make all remittances payable to The Technical Publishing Company.

Entered as second-class matter at the San Francisco Post Office as "The Electrical Journal," July 1895.

Entry changed to "The Journal of Electricity," September, 1895.

Entry changed to "The Journal of Electricity, Power and Gas," August 15, 1899.

Entry changed May 1, 1906, to "The Journal of Electricity, Power and Gas," Weekly.

VOL. XX APRIL 11, 1908 No. 15

EDITORIAL.

ENGINEERING SECRECY.

It seems necessary to the life of any fraternity that it possess some secret that is jealously guarded and ofttimes forms the incentive that induces membership from the curious. So with the growth of an engineering brotherhood, and in particular an electrical fraternity, we often find this false idea of secrecy firmly established, but with this difference, that even members are kept in the dark as much as possible respecting the mysteries of the other man's work. By this we refer not so much to the reluctance to impart information that will benefit a competitor, as to withholding the experience-gained knowledge that will prevent some co-worker from repeating the same mistake.

Its motive is supremely selfish and directly antagonistic to the fine conception that man's value to society depends upon the impetus he may have given to the advancement of human progress along whatever direction his abilities best permit. Our debt to our predecessors in the way of crystallized knowledge can be paid to posterity only by adding our own contribution of discovery or production. It is deemed the first duty of everyone to cultivate the mode of expression by which he may best advance his fellow creatures and add to the sum total of knowledge. The artist enriches our lives by his painting, the composer by his music, the sculptor by his statuary, the author by his writing, the orator by the effect of his speech, and the engineer by his achievements.

Each expresses his personality in his own way, in accordance with the faculties that he has most highly developed. The names that endure in the lists of Fame are of those who have furthered human progress. We all can add our small quota, which unbeknownst to ourselves, possibly may be magnified, even as was the widow's mite. To be effective, our work must be evident. A clock without hands, be it running ever so regularly, is not more useless than a worker without expression. If we cannot write, we should talk, that others may write. If we cannot talk nor write, we should use our hands to the best of our ability and thus leave some monument of our endeavors, more lasting than mere riches.

Often has progress been delayed because great minds had to work out problems which had been solved years before. This wasted energy would have been available for greater works if the knowledge of the simpler had been known.

There is no function of history that is more important than that of preventing the re-duplication of effort, and from it the wise man learns by the mistakes of others. If we "hide our light under a bushel," we not only blind ourselves with its little importance, but also compel others to work without its aid, whereas the two combined might soon make clear the way of attack. "My light is none the less for having lit that of my neighbors." The interchange of technical knowledge makes all richer and none poorer, and as a cold business proposition is a good paying investment as is amply testified in the record of all scientific advance. The petty craving for credit has often overreached itself by prematurely causing the demise of the silent worker, whose efforts are thus lost to the world. The loss is the more regrettable because it is the more easily avoidable. Personal gain can or should be insured by patent. This publicity will provoke suggestions of improvement from others, which may again be turned to personal advantage.

Commercial exigencies have caused corporations to put the seal of secrecy on the lips of all their employees, often lessening ambition's spur to do even more. Details as to cost are withheld because of fear of criticism from others in the same field or for fear of smaller margin of sales profit. If publicity were given to these facts, processes would be improved in accordance with the adage that "two heads are better than one," and renewed public confidence would cause greater sales to compensate for smaller profits. The friction of universal secrecy would almost stop the wheels of industry, whereas the mutual exchange of ideas imparts an added moving force which advances both the helper and the helped as a result of the economy of effort and because of the removal of opposition.

THE SHOW IS OFF.

The shortness of time in which to prepare for the San Francisco Electrical Show, scheduled for the week of the eleventh of May, has necessitated calling it off at the eleventh hour. Eastern exhibitors desiring to make a large display could not possibly secure the necessary material in the limited time available, and consequently declined to exhibit. The manifest injustice and discrimination against them has been deemed by the directors sufficient cause for this action. But plans are already being perfected for another and bigger Exposition to be held in October of this year, in which every facility will be afforded for a fitting electrical representation.

PERSONAL.

Mr. T. C. Clifford, representing the Pittsburg Meter Company is on the Coast on official business.

Dow S. Smith, formerly general superintendent of the Brooklyn Rapid Transit Company, is at Spokane, Wash.

Mr. A. Genalein has been appointed manager of the Azusa and Glendora division of the Interstate Gas Co. of California.

Mr. C. F. Hewitt has succeeded Mr. G. C. Pierce as general superintendent of the East St. Louis & Suburban Railway of East St. Louis, Ill.

Mr. G. C. Pierce has resigned as general superintendent of the East St. Louis & Suburban Railway Company of East St. Louis, Ill., and expects to visit San Francisco shortly.

Mr. Bunroku Arakawa, professor of the Engineering College of Tokio Imperial University was in San Francisco last week. After inspecting the single-phase equipment of the Vallejo road he proceeded East.

M. L. St. D. Roylance, electrical engineer and draughtsman, for five years connected with the office of Inspectro of Equipment, U. S. Navy, at the Union Iron Works, San Francisco, California, is now located with the equipment department, Navy Yard, Mare Island, California.

Messrs Seligman & Ljungkfist, Swedish engineers, are on the Coast, investigating long distance, hydro-electric transmission. They visited many plants in Southern and Central California and last week investigated the equipment of the Snow Mountain Power Company. They are now in Seattle.

S. P. Russell, Jr., who recently returned to take charge of the electrical department of H. W. Johns-Manville's San Francisco branch has been seriously ill with inflammatory rheumatism. Last week he suffered a partial stroke of paralysis but has re covered sufficiently to be able to go to the springs to recuperate.

Mr. C. W. Burkett, for the past five years chief engineer of the Wisconsin Telephone Company, with headquarters at Milwaukee, is now chief engineer of the Pacific Telephone and Telegraph Company, with headquarters at San Francisco. This company operates in California, Oregon, Washington, Idaho, Arizona and Nevada.

TRADE CATALOGUES.

"When the Clock Struck One," is the title of a unique folder on lamp guards from Harvey Hubbell, of Bridgeport, Conn.

One of the neatest little advertising devices brought to the attention of the "Journal" this year is a card calendar of the F. Bissell Company, of Toledo, Ohio—"The House with the Stocks." Send for one; it will interest you.

Bulletin No. 4570, recently issued by the General Electric Company, Schenectady, N. Y., describes and illustrates the General Electric Tungsten Lamp for 100 to 125-volt circuits. The lamp is made in 40, 60 and 100 watts, and has a life of approximately 800 hours when used on either alternating or direct current. Some of the illustrations show the tungsten incandescent units combined with standard Holophanes, which can be used to excellent advantage in this manner.

The Habirshaw Wire Company, with offices at 253 Broadway, New York City, send a valuable price list of National Electric Code Standard rubber-covered wires and cables for voltages up to 600, inclusive; also for such telephone wires and special cables as have been standardized. This price list is detailed from all sizes of wire on a copper basis of 12 to 25 cents, inclusive, and also includes a rubber factor. Its completeness and conciseness makes it invaluable.

H. Mueller Mfg. Co., of Decatur, Ill., send a leather-bound, loose-leaf catalogue of all their products that forms one of the best reference and ordering books yet received. In it is listed all possible devices and connections used by water, gas and plumbing interests, arranged for rapid and systematic finding. The descriptions are concise and complete, and well illustrated. The volume contains nearly 900 pages, and is arranged for facile addition of new sheets as new goods are made. The typographic and mechanical excellence of the book recommends the goods catalogued.

Graded shunt resistance multigap lightning arresters for 1908 are described in a new bulletin issued by the General Electric Company at Schenectady, N. Y., and numbered 4573. The bulletin also contains detailed descriptions of low voltage arresters, static dischargers, constant-current horn arresters, disconnecting switches, choke coils and the well-known Type M, Form D-2, direct-current arrester for voltages up to 6000. Tables of general data regarding the apparatus, connection and dimension diagrams, etc., are included. The multigap arresters for high voltages consist essentially of a series of knurled cylinders placed closely together, the discharge taking place across the path of gaps thereby produced and being extinguished before the dynamic current can follow it for more than half a cycle by reason of the peculiar composition of the metal making up the cylinders.

WESTINGHOUSE MACHINE CO. RECEIVERS REMOVED.

I have much pleasure in being able to notify the clients and other friends of the Westinghouse Machine Company that the Receivers appointed October 23, 1907, by the Circuit Court of the United States for the Western District of Pennsylvania, were on March 31, 1908, discharged by the same authority. All of the matters which made a temporary receivership expedient have been satisfactorily arranged, and the Company's position is greatly strengthened from every standpoint.

All contracts made by the Receivers for the sale of the Company's product, or for the purchase of materials or merchandise will be carried out as though made by the Company's own officers.

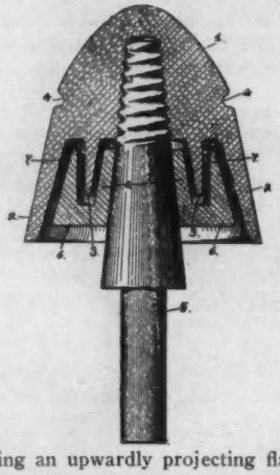
I take this occasion to announce the election of Mr. William H. Donner as the Vice President of the Company in direct responsible charge of all its activities, and to give the assurance of the continuance and accentuation under Mr. Donner's administration of that steadfast policy whereby the clients of The Westinghouse Machine Company have become friends as well as customers.

Geo. Westinghouse, President.

PATENTS

INSULATOR. 882,803. Leonard W. Storror, San Francisco, Cal.

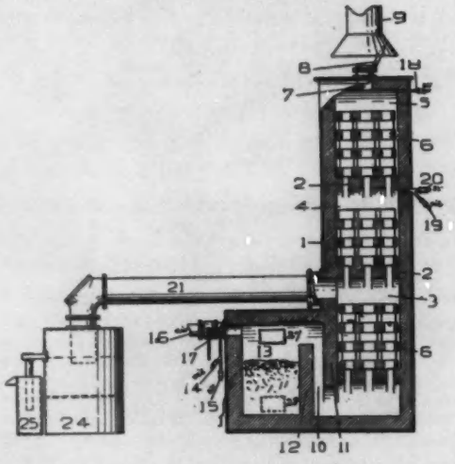
In an insulator, a pin having its top frusto-conical and threaded for a part of the length of said frusto-conical top, a protecting member made of an insulating material and adapted to fit tightly on the frusto-conical part of the pin for the entire depth of the said protecting member, said



member also having an upwardly projecting flange whose outer surface is a portion of a cone, and a wire-carrying insulating member having internal threads adapted to fit the threads of the pin, said wire-carrying member having a skirt adapted to project down into the space between the flange on the protecting member, said wire-carrying member also having an outer skirt extending below the bottom of the protecting member.

PROCESS OF MAKING GAS. 882,764. Leon P. Lowe, San Francisco, Cal.

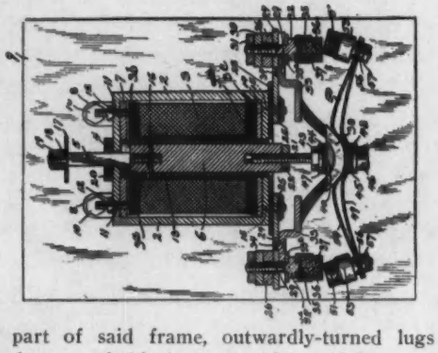
The process of manufacturing gas which consists in passing products of combustion of oil and air entirely through a chamber containing loosely-piled refractory material, to highly heat said refractory material then excluding the air and passing



the oil partly through the chamber and the refractory material therein in the same direction as in the heating stage, and simultaneously passing in the opposite direction steam through part of the refractory material to superheat the same, and oil commingled with the steam so superheated through refractory material in the chamber and drawing off the generated gases together.

ELECTRICALLY-OPERATED SWITCH. 883,059. Henry F. Starrett, Milwaukee, Wis., assignor to the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

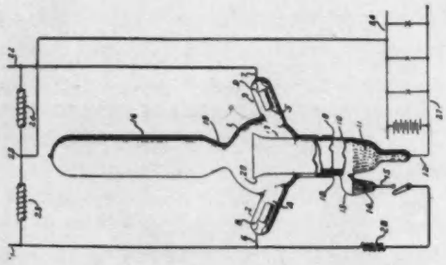
In an electrically-operated switch, the combination with a frame adapted to contain a magnet coil and surround said coil upon its sides and ends, of a supporting plate secured to



the upper part of said frame, outwardly-turned lugs formed upon said plate, a suitable base to which said lugs are adapted to be secured, insulated bridging plates secured to the lower part of said frame, contact plates secured to said bridging plates and electrically conductive posts mounted on said base and secured to said bridging plates, to support said frame.

VAPOR ELECTRIC APPARATUS. 883,030. Osias O. Kruh, Schenectady, N. Y., assignor to General Electric Company.

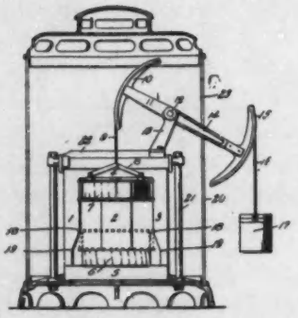
In a vapor electric apparatus, the combination of an envelope or receptacle having a plurality of projecting arms



or chambers, electrodes in said arms or chambers, a vaporizable electrode located also in said envelope, and means for causing the arc of discharge from said vaporizable electrode to be projected past the openings into said arms or chambers.

ALTERNATING-CURRENT REGULATOR. 883,007. Augustine R. Everest, Rugby, England, assignor to General Electric Company.

In a constant-current transformer, the combination of a primary winding, a secondary winding, means for allowing the said windings to move away from each other upon in-



crease in current and to approach each other upon decrease in current in the secondary winding, and means for varying the mean length of the air gap in the path of the leakage flux between said windings as said windings change their relative position.

INDUSTRIAL

NEW ALLIS-CHALMERS ALTERNATOR FOR THE NEVADA-CALIFORNIA POWER COMPANY, GOLDFIELD, NEV.

The Nevada-California Power Company, formerly the Nevada Power, Mining & Milling Company, Goldfield, Nev., is preparing to install a fourth Allis-Chalmers alternating current generator, of the water wheel type, having 1500 kilowatt rated capacity, to augment the enlarged power service, now contracted for in the vicinity, pending the completion of their new hydro-electric stations on Bishop Creek, Inyo County, California.

The unit is a 3 phase, 60 cycle, 2200 volt machine, to run at 400 revolutions per minute, and is arranged for direct connection to a water wheel operating under an 850-foot head, alongside of three similar units already installed and similarly driven, the last of which was placed in service in 1905.

These generators are of the standard Allis-Chalmers water-wheel type, with two bearings and extended shaft. The stationary armatures of the machines are of the usual construction, with box frame, self supporting yoke. The rotor spider is specially strong in order to stand abnormal water-wheel speed in case the governor should fail to work. The spider is a solid steel casting, and the pole pieces are securely held by dovetail projections. The field windings are of copper strip wound on edge and designed for 120 volt excitation.

Current from these generators is transmitted 113 miles at 60,000 volts to Tonopah and Goldfield, Nevada, with branches from this line to other points, and supplies power to a number of the mines in that district whose equipment is electrically operated. The following are a few of the properties in Tonopah and Goldfield which have installed Allis-Chalmers Induction Motors ranging in size from 5 to 100 horse-power, and are supplied from the Nevada-California Power Company's mains:

Goldfield Consolidated Mines Co., Goldfield Milling & Mfg. Co., Nevada-Goldfield & Reduction Co., and Montana-Tonopah Mining Co. The latter company has installed fifteen motors, aggregating 600 horse-power.

With the completion of its two stations, the Nevada-California Power Co. will possess hydro-electric power facilities unequalled in this section, as there are two plants already in operation, and the combined capacity will be 14,000 horse-power. Much additional power can also be developed, as the company controls 3200 feet of fall on Bishop Creek, and large storage reservoirs can be built on the headwaters of the stream at no great cost.

CUTLER-HAMMER COMPANY.

The contract for the electric turret-turning gear of the U. S. S. Delaware, now under construction at Newport News, has been awarded to the Cutler-Hammer Mfg. Co., of Milwaukee.

This company designed and built the electric turret turning gear installed in the port, after turret of the Indiana, the crew of which holds the world's record for marksmanship—ten shots in two-and-a-half minutes, all hits.

Every modern war vessel is equipped with a complete electrical plant, the specifications of some of the newer battleships calling for generators having a combined output of 800 kilowatts.

In addition to illumination, wireless telegraphy and interior signal systems, electricity is used on ship board in connection with the refrigerating plant, ventilating fans, forced-draft blowers, and for operating ammunition hoists, boat cranes, deck winches, etc.

WESTINGHOUSE TYPE E ELECTROLYTIC LIGHTNING ARRESTERS.

As the result of experiments covering a number of years, the Westinghouse Electric & Mfg. Company has developed an electrolytic lightning arrester consisting of a number of aluminum plates pressed into tray form so that when set one within the other, separated by small insulating washers, they may be built into a column capable of withstanding high voltages and still retain the safety valve characteristics of a single plate. These columns are made in two sizes, one for voltages between 4000 and 7500, the other for voltages between 7500 and 15,000. The columns are enclosed in substantial stoneware jars. The jars may be mounted one upon the other to form arresters for any desired voltage. A gap on the line side of the electrolytic elements, which will withstand the normal voltage of the system, breaks down with over-voltage and permits the surge to discharge through the electrolytic units.

The electrolyte is dissolved in pure water and poured into the top of the arrester unit. It thus fills the first tray and runs over into the second and so on through the column, the surplus escaping through a hole in the bottom of the containing jar through the next jar, if there be more than one, to the pan at the bottom.

The electrolyte fills only the trays and not the jar, so there is no opportunity for the current to pass except from tray to tray. Each unit when placed in the pan or on another unit automatically makes contact.

The electrolytic solution causes a very thin film to form on the aluminum plates. This film has an apparent resistance of very high value when moderate voltages are impressed upon it, but when the voltage reaches a certain value, it breaks down in myriads of minute punctures, making almost a short circuit. As soon, however, as the voltage is reduced again, the punctures seal up at once and the original high resistance reasserts itself. These arresters are arranged for installation either indoors or out, as suits the convenience of the user.

ELECTRICAL EQUIPMENT FOR COMPANHIA DOCAS DE SANTOS (SANTOS DOCK CO.) BRAZIL.

The Companhia Docas de Santos (Santos Dock Co.), through whose docks most of the coffee exported from Brazil passes, has recently placed a large order with the General Electric Company for complete electrical equipment of their sub-station and docks at Santos. The order is comprehensive and includes six 3000-kilowatt, water cooled, three phase, 60 cycle, 40,000-6600 volt transformers, twenty-three panel switchboard and the necessary cables and wiring supplies. The order also includes five fifty-light constant current transformers, 208 series arc lamps, 420 multiple arc lamps, a large number of induction motors for operating air compressors, hoists, cranes, etc., and a large number of type H oil cooled transformers.

Besides furnishing power for the docks, the sub-station will also supply energy for light and power to various other enterprises thereabout.

Power is supplied at a line potential of 40,000 volts by a hydro-electric plant some thirty-five miles from Santos, the equipment of which was furnished by the General Electric Company two years ago.

CIVIL SERVICE EXAMINATIONS.

The United States Civil Service Commission announces an examination on April 15, 1908, to secure eligibles from which to make certification to fill a vacancy in the position of engineer (with knowledge of ice machinery, pumping, and electrical plants), $900 per annum, Indian Service, Colorado River Agency, Ariz., and vacancies as they may occur in the Indian Service in the positions indicated below.

An examination will be held on May 6-7, 1908, to secure eligibles from which to make certification to fill two vacancies in the position of chief engineer, third class, $115 per month each, in the Coast and Geodetic Survey, for service in the Philippines, and vacancies requiring similar qualifications as they may occur in the Coast and Geodetic Survey. The Department states that the appointees to the specific positions mentioned will, upon their arrival at Manila, be promoted to the position of chief engineer, first class, at $140 per month.

Each applicant must submit with his application a license from the United States Local Inspectors of Steam Vessels as chief engineer for ocean 500 tons, or a certificate from the Steamboat-Inspection Service that he has such license.

The United States Civil Service Commission announces an examination on May 6-7, 1908, to secure eligibles from which to make certification to fill from ten to twenty vacancies in the position of junior engineer in the Technologic Branch of the Geological Survey, at salaries ranging from $1,020 to $1,380 per annum, and vacancies requiring similar qualifications as they may occur. Temporary appointments to the position of engineering aid or apprentice may also be made from the eligible list resulting from this examination, at salaries ranging from $720 to $960 per annum. The examination will consist of the following subjects: Elementary chemistry, physics, and mathematics. Essay of not less than 500 words on one of the following subjects (both English composition and drawing will be rated on this subject): (a) On a mechanical engineering subject, accompanied by drawings; (b) on a civil engineering subject, accompanied by drawings; (c) on a mining engineering subject, accompanied by drawings. Mechanics and dynamics of engineering. Engineering special subjects: (a) Testing of structural materials, with outline of necessary observations and computations; (b) testing of fuels, with outline of observations and necessary computations; (c) mining operations, including tunneling, blasting, hoisting, ventilation, shaft sinking, etc. (Ten questions will be given under each subject). Not more than one subject may be taken by any applicant. Training and experience (rated on application form). The vacancies to be filled in the junior engineer grade are in three distinct lines of employment: (1) For testing structural materials, for which an educational groundwork corresponding to the degree of civil engineer or B. S. in civil engineering should qualify the applicant; (2) for testing fuels, for which an educational groundwork corresponding to the degree of mechanical engineer or B. S. in mechanical engineering should qualify the applicant; and (3) for the investigation in the field of methods of mining and production of fuels and structural materials and related subjects, for which an educational groundwork corresponding to the degree of mining engineer or B. S. in mining and engineering should qualify the applicant.

The United States Civil Service Commission announces an examination on May 6, 1908, to secure eligibles from which to make certification to fill vacancies as they may occur in the position of apprentice in the Mint and Assay Service at Philadelphia, Pa., New Orleans, L. A., Denver, Colo., and San Francisco, Cal., at salary as follows: First year $3.50, second year $4, and third year $4.50 per diem.

An examination will be held on April 29, 1908, to secure eligibles from which to make certification to fill at least three vacancies in the position of magnetic observer (temporary) in the Coast and Geodetic Survey, and vacancies requiring similar qualifications as they may occur. The salaries will range from $60 to $75 a month, according to the character of the work and the qualifications of the applicant; and in exceptional cases where the person employed has had repeated experience in magnetic work, the salary may reach $100 a month. Appointments to permanent positions are made from the examination for laboratory assistant in the Bureau of Standards. In the prosecution of the general magnetic survey of the United States and outlying territories, it will be necessary at times, and especially during the summer months, to employ temporarily and for short periods a number of men of the requisite scientific training. Applicants must, therefore, state distinctly in their applications their periods of availability. The time when and the place where such persons are to be employed can not be definitely stated. Persons are desired who have had experience in a university or college as professor, assistant professor, teacher, or tutor in physics or allied sciences; or persons who have taken post-graduate degrees in physics or allied sciences; or students who have had not less than two years' work in physics or allied sciences, including laboratory practice.

As a means of increasing the efficiency of plug and pin bonds the Chase-Shawmut Company, of Newburyport, Mass., presents the Shawmut Auxiliary Bond, a copper cap with rail engaging flange filled with solder, heated and applied to end of bond, and thus by giving additional contact surface reduces to a minimum the resistance at the rail joint. A recent test made with auxiliary bonds applied on new plug bonds just installed showed that an improvement of over 15 per cent in conductivity resulted. With a bond 15 per cent better than a new plug bond and having the advantage of a permanent metallic union, as contrasted with an uncertain pressure contact, the Chase-Shawmut Company believes that all railroad men will appreciate this means towards cost reduction.

Among the orders recently received by the General Electric Company are the following: Three hundred 4-motor equipments for the Chicago Railway Co.; three 1000 kilowatt, 2300 volt, 3-phase alternators for the Manchurian Railway, Korea; twenty-five GE-202, 600 volt, 2 motor equipments, and forty type H oil cooled transformers for the Sao Paulo Light & Power Co., Sao Paulo, Brazil. A shipment of two 50-kilowatt, cross compound marine sets, together with switchboards and necessary instruments, has been made to Olongapo, P. I. These will be used in the U. S. Government drydock Dewey, which recently made the trip around Cape Horn.

The rapid advance of the Dossert Solderless Connectors in the trade is shown by the steady increase in orders received for these remarkably efficient labor saving devices. Among recent orders received by Dossert & Company, 242 West 41st Street, New York, are third rail clasp connectors for 1,000,000 C. M., cable from the New York Central & Hudson River R. R. Co., cable taps 400,000 C. M., main to 0000 bleeder from the Chicago City Railway Co., and cable taps for 1,000,000 C. M., cable from the Syracuse & South Bay Electric Ry. Co.

Dossert & Company, 242 West 41st Street, New York, have received an order for 400 solderless cable connectors from the San Francisco Gas & Electric Company. F. A. Lawson & Company, Pacific Coast agents, write that Dossert solderless connectors have been specified in the plans for the wiring of the new Palace Hotel and Emporium Building, San Francisco.

NEWS NOTES

ELECTRIC RAILWAYS.

Spokane, Wash.—Col. A. M. Dewey, of Spokane, is projecting an electric railway from Spokane to Omak, Okanogan County, Wash., to connect with the proposed Okanogan Electric Railway, thus shortening the distance between Spokane and the Puget Sound country and the Canadian Northwest by 100 miles.

Harry J. Neely, of Spokane, is heading a campaign by residents of opportunity in the Spokane Valley to secure another car line from Spokane. It is proposed by the committee in charge to offer to do a greater part of the grading, and if neither of the traction lines in Spokane can be induced to build, then a gas motor company will be organized to handle the tonnage.

An assignment of franchises, rights and privileges in Spokane and Hillyard to the Spokane & Inland Empire Railroad Company has been filed with the city clerk by the Spokane Traction Company. This is the final step in turning over the titles of the Traction Company to the Spokane & Inland. All the city lines of the former company were assigned to the latter by Jay P. Graves and William G. Davidson, president and secretary respectively of the Spokane Traction Company. The Spokane & Inland has been in practical control of the Traction Company interests since last Fall, when a reorganization of the electric lines, by which all were amalgamated and stock issued to the shareholders of each in the new company, was effected. The Spokane Traction Company has now legally ceased to exist as a separate corporation.

Announcement has been officially made that the Power Development Company, a subsidiary corporation of the Spokane & Inland Electric Railway Company, and one of the corporations belonging to the Inland Empire system, will have a surplus of from 10,000 to 15,000 horsepower from the power station at Nine Mile bridge as soon as the plant is completed, after supplying electric power to the railway lines of the system. It is purposed to utilize this power by supplying light and power to the citizens of Spokane under the franchise bought by Jay P. Graves, president of the system, and associate from Frank P. Hogan. This franchise was granted by the City Council five years ago to a company organized to develop the power down the river at the rapids known as the Bowl and Pitcher. It was for 50 years, and was subsequently acquired by Frank P. Hogan, who also secured the water rights at the Bowl and Pitcher rapids. These water rights passed with the franchise to Mr. Graves of the Inland Empire system, who afterwards transferred them to the company of which he is the head.

Julius Muhrbeck, superintendent of construction of the Spokane & Inland Empire electric system, announces that the laying of steel rails between Palouse, Wash., and Moscow, Ida., will begin at once. The grading between the two points was practically completed last Fall, and it is believed that trains will be running into Moscow early in August. There are also persistent rumors that the line will be extended to Lewiston, Ida., this year. The company has been petitioned by farmers and ranchers in Whitman County to extend the line from Steptoe to St. John. George P. Howard, a prominent farmer at Pleasant Valley, has made a canvass of the farmers along the route of the proposed extension, and without exception they have agreed to donate the necessary right of way, and a number of them have expressed a willingness to take stock in the road. From the junction at Steptoe to St. John the valley through which the road will run is an immense wheat field. If this part of the road is secured an endeavor will be made to have it continued to Cheney by Rock Lake, crossing the main line of the Northern Pacific in the vicinity of Tyler, 12 miles east of Sprague.

TRANSPORTATION.

Riverside.—Teams and men have commenced work on grading for the Riverside-Colton trolley line.

Los Angeles.—Only one offer was made when the City Council received bids for purchase of the street car franchise for the South Park Avenue line from 30th Street to Slauson Avenue. The L. A. Railway Company, which operated the line until it was recently disposed by the Supreme Court, offered $500, which was accepted.

San Francisco.—General Manager Charles N. Black, of the United Railroads, has returned from his inspection trip over the lines of the Northern Electric Company, and he declares that his trip over the road was only for personal reasons, and incidentally to accommodate Eastern friends, who had asked him for a general opinion about the property of the electric road.

San Francisco.—The consideration of a 7-year franchise to the Presidio and Ferries Railway Company to install an overhead trolley service over six blocks, starting at Union Street and via Larkin, Vallejo and Franklin Streets back to Union, was postponed by the Public Utilities Committee of the Board of Supervisors for one week, to give the residents of the district affected an opportunity to express their wishes.

Los Angeles.—The real battle for the beach passenger traffic was begun between Harriman and Huntington, when the former started the operation of the fastest cars ever brought to California over his Los Angeles-Pacific system, just standard-gauged and reconstructed throughout. Heretofore, the Harriman lines, with antiquated coaches and inadequate equipment, have not cut materially into Huntington's business; but now his Los Angeles and Redondo line will be directly affected. Work was rushed at a remarkable rate on the Harriman system, and it was completed three weeks in advance of the time scheduled. The new cars, which are to be run in trains of three, are olive green, and have several features that are innovations in trolley service. In addition to the side entrances there are wide swinging doors in the center at either end, making an open passage from coach to coach, and a practically vestibuled train. The motor box and automatic brake are located in a right-hand corner of the car, and the headlight is attached to the center door. Each car seats 58 passengers, and is capable of making 60 miles an hour.

WATER WORKS.

Rawhide, Nev.—Contracts are being advertised to install waterworks from wells below town. The water system is assured, as $100,000 has been subscribed.

Georgetown, Cal.—Norval Douglas has filed a notice of appropriation of 5,000 inches of the water flowing in Travis Creek below the junction of Bear Creek, to run machinery to generate electricity.

Chihuahua, Mex.—Gov. Creel gave out the information that a commission, headed by Thos. S. Shepard and the City Engineer, has been named, to study plans for extending the water and sewer systems of this capital. Gov. Creel states that a large tank will be placed at the new penitentiary, to provide water for that part of the city above Chihuahua and Pacific depot.

TELEPHONES.

Hood River, Ore.—The farmers of the West Side have organized the Farmers' Telephone Company.

Hermiston, Ore.—The Eastern Oregon Telephone Company is rushing work on the new telephone exchange.

Chehalis, Wash.—E. A. Marsh has made application to the City Council for a franchise to construct a local telephone system.

Index, Wash.—A telephone line is being erected between the Sunset mining camp and Camp Ecki, to connect with the Index system.

Roseberry, Idaho.—The Long Valley Telephone Company has filed articles of incorporation. This was formerly the Mutual line.

Prosser, Wash.—An ordinance has been passed by the City Council granting the Benton Independent Telephone Company a franchise.

Whitefish, Mont.—Carl Green has the poles on the ground for his new telephone system, and will lose no time in getting the plant in operation.

Davenport, Wash.—By agreement the Farmers' Telephone Company will build lines to the city limits and there connect with the city system.

Anatone, Wash.—The Farmers' Mutual Telephone Company lately met in Clemans' Hall to perfect plans for running a line from Anatone to Asotin.

Independence, Ore.—The Home Telephone Company has been organized. A modern telephone plant will be built, known as the common battery system.

Antone, Wash.—Bids are being received by G. E. Zimmerman, secretary Antone Farmers' Mutual Telephone Company, for the construction of a telephone line from Antone to Asotin.

Kirkland, Wash.—Jas. Bell, manager of the Lake Washington Telephone Company, went to Bothell lately to canvass the residents of that vicinity in the interests of extending the line to that town.

Miles City, Mont.—Reports are out of the organization of a telephone company to conduct a line from Miles City to Forsyth. Kent McLean, Major Edwards and others are interested in the project.

Miles City, Mont.—F. C. and E. A. Hughes of the electric light firm of Glendive were in the city recently conferring with local people relative to the construction of a toll telephone line between this place and Glendive.

Eugene, Ore.—The Pacific States Telephone & Telegraph Company has appropriated $20,000 for improvements to its system here this summer, and an engineer is now mapping out the work, which will begin within a few weeks.

Seattle, Wash.—The county commissioners have lately heard A. W. Davis of Redondo Beach and Secretary Hickey of the Sound Trustee Company on the petition of Davis for a franchise covering the streets of Redondo Beach. The board has taken the matter under advisement.

Centralia, Wash.—Eugene A. Marsh of Portland presented his application to the City Council for a franchise to establish a telephone system in the city. B. E. Clements, also of Portland, has a franchise for a telephone system in the city, and has until April 1st to begin construction.

Weston, Ore.—A plan is on foot for an independent telephone system requiring 20 miles of wire to connect Weston with the Blue Mountain sawmill, Bingham Springs, W. J. Furnish's Summer home on the Umatilla River, and the permanent camp of the government forest rangers at the forks of this stream.

Wenatchee, Wash.—The ranchers of Stemilt Hill met and organized a telephone company, to be known as the Stemilt Hill Telephone & Telegraph Company. O. Allenbaugh was elected president; Dan Chisolm, vice-president; W. McPherson, secretary, and Henry Wills, treasurer. The company will build its line so as to connect with the Farmers' Telephone Company, whose headquarters are here.

Hailey, Idaho.—The National Forest Service will spend considerable money in this section. The bulk of $17,000 which is for expenditure will be expended in the Wood River watershed. The most important of this work will be the construction of a telephone line from Ketchum, the present terminus of the Rocky Mountain Bell Company, to Stanley Basin, thence down the Salmon to Robinson Bar—about 90 miles. This line will follow the main road to Robinson's, on the Salmon River, and afford a means of communication between all the mines and ranches within 30 or 50 miles of the line to Wood River, as every facility to build connecting lines is to be afforded those who desire it. From Galena an extension will be made west 25 miles to Atlanta, that is, just within the boundary of the Sawtooth West National Forest.

POWER AND LIGHT.

Spokane, Wash.—Official announcement is made that $1,000,000 of the $3,000,000 realized by the Washington Water Power Company, of Spokane, from the sale of an issue of 5 per cent notes, will be used in extending its power line in the big Bend country, tapping the towns of Davenport, Sprague, Ritzville, Paha and Lind, Wash. The other $2,000,000 will be devoted to refunding an issue of $2,000,000 of 5 per cent notes maturing July 1, 1908. It is given out that the steam relay station at Ross Park, Spokane, will be increased to 16,000 horsepower from 4,000 horsepower, and that the waterpower plant at Post Falls, Ida., will be increased from 12,000 to 15,000 horsepower. This means that by next August the company will have 44,000 horsepower, or an increase of 15,000 horsepower at present. The company already has two high-power lines running east to the Coeur d'Alenes, and another south to Colfax, Palouse and Oakesdale. R. Lewis Rutter, secretary of the Spokane & Eastern Trust Company, which placed the paper in New York, Boston, Philadelphia and Chicago, says the issue was subscribed in less than 20 days, and that several of the largest financial houses in the country bought blocks of from $100,000 to $200,000. Orders came from every part of the country, and more than $100,000 could not be filled because of over-subscription. He added that this is probably the most remarkable flotation of securities ever made by a Northwestern corporation.

FINANCIAL.

Lodi.—May 5th has been decided upon as the time to vote on the proposed bond issue of $126,000 for water, light and sewer systems.

Los Angeles.—The Southern Trust Company has subscribed to $25,000 worth of Owens River bonds. City Treasurer Hance says that the entire allotment of $510,000 will be disposed of by the last of next week.

Salinas.—The Gonzales Electric Company has been incorporated with a capital stock of $75,000, by H. M. Pitman, of Calistoga; M. C. Clark, of Gonzales, and E. Johnson, of Oakland. The place of business is Gonzales.

Vallejo.—At the last meeting of the Board of City Trustees, April 16th next was set as the date for the bond election, when an issue of $85,000 to build a second reservoir for the municipal system in Wild Horse Valley will be determined.

Petaluma.—The comparative statement of earnings for the month of February of the Petaluma & Santa Rosa Railway Company is as follows: Gross earnings, 1908, $13,903.52; 1907, $12,837.48; operating expenses, taxes, etc., 1908, $13,205.40; 1907, $12,087.54; net earnings 1908, $698.12; 1907, $749.94.

Honolulu.—At the annual meeting of the stockholders of the Hawaiian Electric Company, Ltd., February 29th, the following officers were elected: President, J. A. McCandless; vice-president, F. W. Macfarlane; treasurer, F. C. Atherton; auditor, Godfrey Brown; secretary, W. L. Hopper. The above also constitutes the board of directors.

Lodi, Cal.—At the last meeting of the city trustees the proposed bond issue was considered. For the sewer system the plans call for an expenditure of $50,000, and for light, power and water system $76,000, making a total bond issue of $125,000. The date of election, the interest on the bonds and the time they should run will be fixed at the next regular meeting on April 6th.

San Francisco.—A mortgage and deed of trust, executed by the Pacific Gas & Electric Company to the Trust Company of America to secure the latter in guaranteeing a bond issue of $4,000,000 by the lighting corporation, has been filed in the recorder's office. The mortgage covers all of the real and personal properties of the gas company. The bonds are to run for 30 years, and bear 6 per cent interest.

San Francisco.—The Pacific Gas & Electric Bonds Company has deposited with the Union Trust Company $250,000, and will ask offerings from the bondholders for the redemption of bonds to that amount, out of which the lowest offerings will be accepted. This company calls each year for the redemption of its bonds, as provided by the sinking fund. The redemption will take place on April 7th.

Oakland, Cal.—Water rates for the coming fiscal year will be reduced not less than five per cent, with a probability that a cut of ten per cent in private consumers' rates will be effected by the city council. This forecast is based upon the existence of an agreement between the People's Water Company and the city council under which the company last year stipulated that a cut of not less than five per cent would be made voluntarily for the year 1908-9.

New York.—No public offering of new issue of the United Railways Investment Company will be made. It will be used for refunding directly the floating obligations of the United Railroads of San Francisco, and in case any of the creditors of the San Francisco line do not care to accept the new notes in discharge of the indebtedness, plans are being formulated to place a part of the notes privately, so as to secure sufficient cash to pay off those who want a money payment.

Santa Barbara.—The failure to dispose of $36,000 remaining of the old bond issue of $200,000 has left this city without funds to continue work on the water tunnel through the Santa Ynez Mountains. The City Council met in an executive session with the water commissioners, and it was decided that in asking the people to vote more bonds, something more attractive to investors should be provided. The present bonds were issued in series maturing annually, and bearing 4½ per cent interest.

San Francisco.—Supervisor Rixford introduced a resolution at the last meeting of the Board including in the proposed secondary bond issue an item of $10,000,000 to provide for the purchase from the Spring Valley Water Company of the Crystal Springs, San Andreas, and Pilarcitos reservoirs and water-sheds to be used later as a part of the city's proposed Sierra supply system. It is proposed the money to be paid the Spring Valley Company for the property shall be expended by that corporation in the improvement of its remaining property, that it may be in a better position to supply the city pending the creation of the proposed Sierra system.

Oakland.—The City Council has deferred the fixing of water rates until next week, when the Peoples' Water Company will probably submit to the Council a proposal to end the controversy arising annually as to the value of the system of the water corporation, by establishing a permanent valuation on which the rates of all future years will be fixed. This proposal, not yet brought officially to the attention of the Council, and now in the hands of City Attorney McElroy, provides for the abandonment of the injunction suits brought by the Contra Costa Water Company four years ago to prevent a reduction in the then prevailing high rates which were collected up to last year when they were cut 10 per cent.

Petaluma, Cal.—The annual report of the Petaluma & Santa Rosa Railway Company for the year ended December 31, 1907, shows that during the year 620,219 passengers were carried on the railway and 8,761 on the steamers, a total of 628,980 passengers; 40,287 tons of freight were carried by the railway and 53,080 tons handled on the steamers. The total passenger-car mileage was 304,525 and the total freight and miscellaneous-car mileage was 208,216, making the total car miles 512,741. The steamers made a total of 26,250 miles. The operations for the year 1907 were as follows: Gross earnings, $216,642.45; operating expenses, $155,935.31; net earnings, $60,707.14; fixed charges, $61,106.88; deficit, $399.74. The total cost of the construction and equipment of the road to December 31, 1907, was $1,105,942.23. Of the first mortgage bonds $698,000 are issued and outstanding; of the second mortgage bonds $250,000 have been issued, $217,000 having been sold and $33,000 remaining in the treasury of the company.

TELEPHONE AND TELEGRAPH.

Vallejo.—On the recommendation of the Board of Works, the trustees concurred in the move to install a four-circuit storage battery switchboard fire alarm in the city. The improvement will cost about $1,250.

Salt Lake, Utah.—The Salina Telephone Company, with headquarters at Salina, Sevier County, has filed articles of incorporation with the Secretary of State. The capital stock is $10,000 in shares of a par value of $10 each. The officers are A. J. Lewis, president; E. M. Peyton, vice-president; H. F. Jorgenson, secretary.

San Francisco.—A demand for an increase of pay for electricians in the employ of the city is to be made by Electrical Workers' Union, No. 537, which has appointed W. L. Rhys, F. P. Noonan, and W. W. Barden to interview the joint Board of Electricity of the police and fire departments. City electricians are paid $90 monthly. An increase to $100 a month will be asked.

San Francisco.—In his annual report to the stockholders of the American Telephone & Telegraph Company, President Theodore N. Cail goes deeply into the financial condition of the concern, and states that dividends amounting to $19,206,100 were paid last year. The gross earnings of the company for the whole country, according to him, amounted to $120,753,200. The operating and general expense was $53,242,300, and the maintenance of the plant, $34,665,700. "At the close of the year," the report reads, "a valuation based on the replacement cost of the existing plant, without any allowance for franchises or unearned increment, showed $488,296,000. Against the American Telephone & Telegraph Company and its associated companies, including capital stock at par in the hands of the public, of $554,939,000. These companies had as cash on hand, quick assets and investments of $101,074,000, so that the obligations against the plant were only $453,865,000, or $34,431,000 less than its appraised value."

ILLUMINATION.

Richmond.—The Richmond Light & Power Company has been awarded a franchise by the Trustees.

Las Vegas, N. M.—A modern electric light and power plant will be provided here in about 90 days. Dr. E. L. Woods, promoter of the enterprise, was in the city last week, and he and Mayor Bursum agreed upon the terms of a franchise that the City Council will probably grant.

San Francisco.—As a preliminary step toward fixing the gas rate for the coming year, four members of the Finance Committee of the Board of Supervisors—Broderick, Johnston, Murphy, and Jennings—at the last meeting, decided to consult with experts with the idea of engaging them to examine the plant and accounts of the San Francisco Gas & Electric Company.

Los Angeles.—At a recent conference it was decided, by a special commission on illumination appointed by Mayor Harper, to act with the Committee on Decoration, to abandon the idea of stringing decorations on the wires above those of the electric railways. It was decided that the bids for electrical work should be opened next week. The plan calls for 34 blocks, and specifications are being prepared by City Electrician R. H. Manahan.

CLASSIFIED LIST OF ADVERTISERS

Air Compressors
Hunt, Mirk & Co.

Alternators
California Electrical Works
General Electric Co.
Standard Electrical Works.

Aluminum Electrical Conductors
Pierson, Roeding & Co.

Annunciators
California Electrical Works.
Electric Appliance Co.
Partrick, Carter & Wilkins Co.
Standard Electrical Works.
Sterling Electric Co.

Asbestos Products
Johns-Manville Co., H. W.

Bases and Fittings
Chase-Shawmut Co.

Batteries, Primary
California Electrical Works
Standard Electrical Works

Batteries, Storage
Electric Storage Battery Co.
Standard Electrical Works.
Sterling Electric Co.
Western Electric Co.

Boilers
Hunt, Mirk & Co.
Moore, C. C. & Co., Inc.
Standard Electrical Works
Tracy Engineering Co.

Boiler Compounds
Dearborn Drug & Chem. Wks.
Johns-Manville Co., H. W.

Buffers
General Electric Co.
Northern Electrical Mfg. Co.

Building Material
Johns-Manville Co., H. W.

Building Paper
Johns-Manville Co., H. W.

Cable Clips and Hangers
Chase-Shawmut Co.

Circuit Breakers
Electric Appliance Co.
Fort Wayne Electric Works
General Electric Co.
Standard Electrical Works.
Sterling Electric Co.

Condensers
O. C. Goeriz & Co.
Moore, Chas. C. Co., Inc.
C. H. Wheeler Mfg. Co.

Conduits
American Circular Loom Co.
Electric Appliance Co.
Standard Electrical Works.
Sterling Electric Co.

Conduit and Moulding Hangers.
Chase-Shawmut Co.

Conduit Fixtures
Electric Appliance Co.
Standard Electrical Works.
Sterling Electric Co.

Cooling Towers
O. C. Goeriz & Co.
Moore, Chas. C. Co., Inc.
Tracy Engineering Co.

Cross Arms
Electric Appliance Co.
Sterling Electric Co.

Dynamos and Motors
Brooks-Follis Elec. Corp.
California Electrical Works
Crocker-Wheeler Co.
Electric Appliance Co.
Fort Wayne Electric Works
General Electric Co.
Northern Elec. Mfg. Co.
Standard Electrical Works
Sterling Electric Co.
Westinghouse Elec. & Mfg. Co.

Elevators
Van Emon Elevator Co.

Electric Car Heaters
Johns-Manville Co., H. W.
Northern Electrical Mfg. Co.
Standard Electrical Works.

Electric Grinders
California Electrical Works
General Electric Co.
Northern Electrical Mfg. Co.
Standard Electrical Works.

Electric Heating Devices
Electric Appliance Co.
General Electric Co.
Johns-Manville Co., H. W.
Standard Electrical Works.

Electrical Instruments
Cutter Co., The
Electric Appliance Co.
Fort Wayne Electric Works
General Electric Co.
Johns-Manville Co., H. W.
Sterling Electric Co.
Westinghouse Elec. & Mfg. Co.
Weston Elec. Instrument Co.

Electrical Machinery
California Electrical Works
Crocker-Wheeler Co.
Electric Appliance Co.
General Electric Co.
Northern Electrical Mfg. Co.
Standard Electrical Works
Sterling Electric Co.

Electric Polishers
Northern Electric Mfg. Co.

Electric Railway Appliances
Pierson, Roeding & Co.
General Electric Co.
Johns-Manville Co., H. W.

Electrical Supplies
California Electrical Works
Chase-Shawmut Co.
Electric Appliance Co.
General Electric Co.
Standard Electrical Works
Johns-Manville Co., H. W.
Sterling Electric Co.

Electric Ventilating Fans
California Electrical Works
General Electric Co.
Northern Electrical Mfg. Co.
Standard Electrical Works.
Sterling Electric Co.

Engines, Boilers, Heaters, etc.
Moore, Chas. C. Co., Inc.

Engineers, Chemical
Hunt, Mirk & Co.
Moore & Co., Chas. C., Inc.
Smith, Emery & Co.
Standard Electrical Works
Tracy Engineering Co.
Westinghouse Machine Co.

Engines, Gas and Gasoline
Hunt, Mirk & Co.
Moore & Co., Chas. C., Inc.
Westinghouse Machine Co.

Engineers and Contractors
Brooks-Follis Elec. Corp.
California Electrical Works